

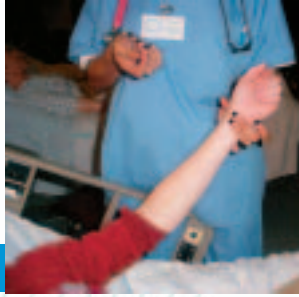


Availability of diagnostic,  
treatment and prevention  
services for acute stroke in  
Montana and northern  
Wyoming 2004

# OVERVIEW

In 2004 most hospitals in Montana and northern Wyoming with 50 or more beds had the basic services to diagnose and treat acute ischemic stroke, although only two-thirds reported EMS stroke screening programs to notify the hospital of a possible stroke. For hospitals in the region with less than 50 beds, approximately half reported that they had a written protocol for rt-PA administration, 48% worked in coordination with EMS to notify the facility of a potential stroke case, and 40% reported 24 hour CT capability.





# BACKGROUND

Many communities have made special efforts to reach stroke victims promptly after clinical trials showed that stroke outcomes could be improved. (1-3) To diagnose acute ischemic stroke, evaluate the individual's risk for complications and initiate treatment with recombinant tissue plasminogen activator (rt-PA) within the 3-hour window from the onset of symptoms requires close coordination between Emergency Medical Services (EMS), Emergency Departments (ED), computer assisted tomography (CT) scanners and stroke teams. (4,5) In 2000 the Brain Attack Coalition identified key elements of stroke care to designate stroke centers capable of providing a spectrum of services that have been shown to improve stroke care and outcomes. (6) Rural and frontier communities in Montana and northern Wyoming face significant challenges in delivering acute stroke care and prevention programs including long geographic distances to tertiary care facilities. In 2004, the Cardiovascular Health Programs of Montana and Wyoming conducted an assessment of hospitals in Montana and northern Wyoming to describe the availability of diagnostic technologies, programs, and personnel for acute stroke care. This report describes the stroke care infrastructure for facilities in this region.



# METHODS

All acute care inpatient medical facilities in Montana and northern Wyoming were identified through the Montana and Wyoming State Departments of Health. Each facility was contacted to identify the medical director and to designate a stroke specialist to complete a 43-item questionnaire adapted from surveys used in other states. Designees who did not respond to the initial mailing were contacted by telephone to request completion of the survey. Data analyses were completed using SPSS V11.5 software (SPSS Inc., Chicago, IL). Chi-square tests were used to compare differences in the availability of individual diagnostic tests, programs, and personnel for acute stroke care stratified by hospital bed size. Large hospitals were defined as those with more than 50 inpatient beds and small hospitals were defined as those with 50 or fewer inpatient beds. Wilcoxon rank-sum tests were used to compare the median number of personnel, diagnostic technology, and programs and services by hospital size. Personnel included neurologists and neurosurgeons; interventional capabilities were also identified. Diagnostic equipment included each of the technologies listed in the Appendix. Programs included Emergency

Departments (ED), intensive care units, stroke units, inpatient rehabilitation units, stroke teams, ED stroke protocols, rt-PA protocols, acute stroke care maps or pathways, dedicated anticoagulation clinics, community stroke awareness programs, and EMS pre-hospital stroke assessment programs. Criteria for a primary stroke center adapted from the Brain Attack Coalition included the following: stroke team, written stroke protocols, EMS pre-hospital notification, ED protocol, designated stroke unit, neurosurgical and neuroimaging capability, and laboratory support. (6)





# RESULTS

Fifty-eight of 67 (87%) hospitals responded to the survey. The mean inpatient bed size for these facilities was 49 (range 2 to 347). The mean bed size for large hospitals (>50 beds) was 178 (range 86 to 347), and the mean bed size for small hospitals was 19 (range 2 to 50).

Large hospitals were more likely to have ED stroke protocols (100% vs. 45%), acute stroke care maps or pathways (56% vs. 20%), and 24/7 (24 hours a day, 7 days a week) CT capability (80% vs. 40%) compared to small facilities (Figure 1). The differences in the proportion of large and small hospitals that reported EMS pre-hospital stroke identification programs (67% vs. 48%) and written rt-PA protocols (90% vs. 63%) were not statistically significant ( $p > 0.05$ ). Large hospitals were more likely to have each of the other acute stroke diagnostic technologies compared to small hospitals and were more likely to have a neurologist available in person or by phone 24/7 (80% vs. 4%), neurosurgeon (70% vs. 2%), and interventional capabilities (60% vs. 13%). (Appendix A) Large hospitals were also more likely to have community stroke awareness programs compared to smaller facilities (60% vs. 11%).



# RESULTS

Figure 1. Availability of stroke recognition and treatment services, by hospital size, Montana and northern Wyoming hospitals, 2004

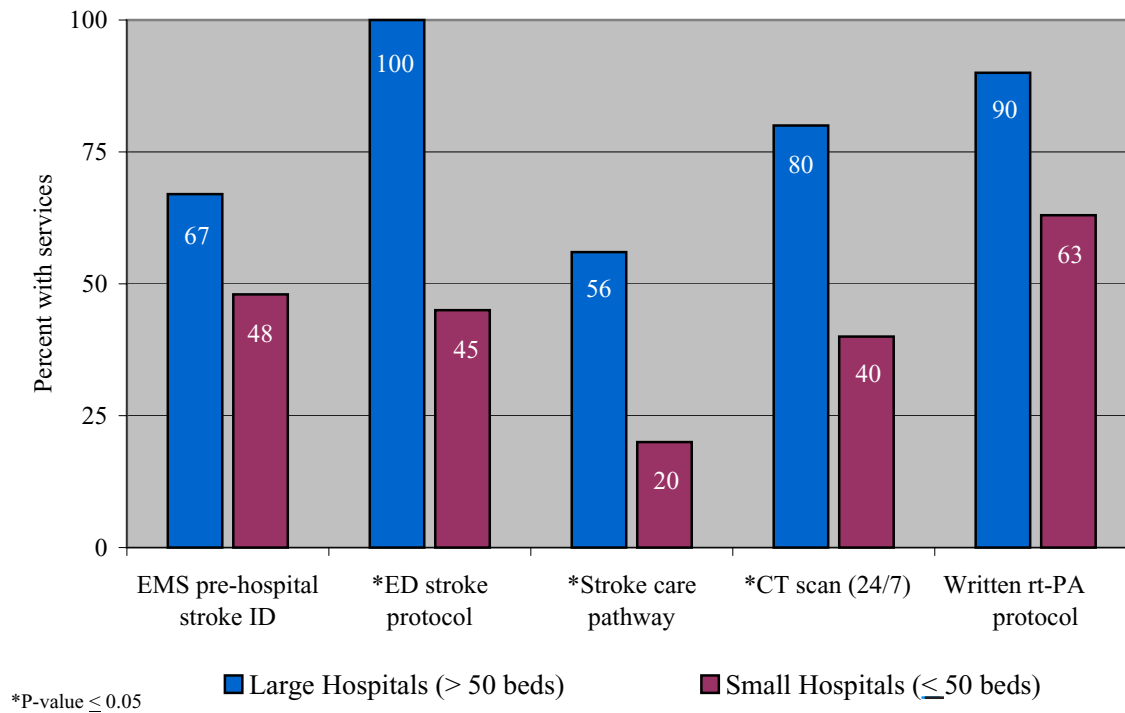
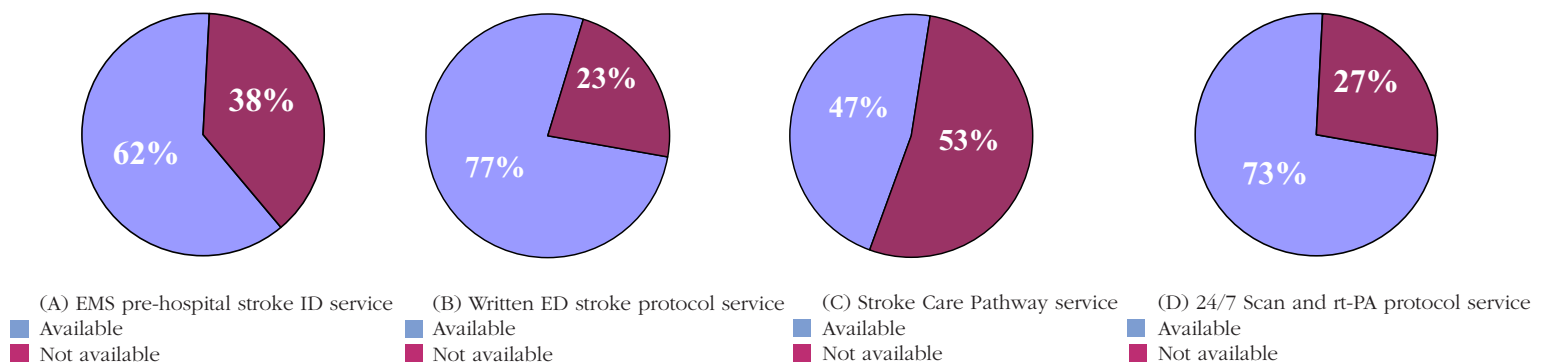


Figure 2. Proportion of Montana residents residing in counties with selected stroke services



# RESULTS

Facilities with more than 50 beds reported significantly more diagnostic technologies, programs and services, and personnel for stroke care (median = 18) compared to smaller hospitals (median = 6). (Table 1) Three hospitals met the criteria for a primary stroke center when we adapted the responses to the questions to approximate the Brain Attack Coalition's criteria.

Approximately three quarters of the population in the two state region live in counties where the local facility had both 24/7 CT capability and a written rt-PA

protocol in place. (Figure 2 D) The majority of residents resided in counties with hospitals that had 24/7 CT capability (81%), rt-PA protocols (83%), ED stroke protocols (77%), a neurologist available 24/7 (54%), and EMS pre-hospital stroke identification programs (62%). It is interesting to note that 10 hospitals indicated that CT was available but not on a 24 hour schedule. Figure 3 illustrates the counties where facilities reported none, one, two or all three of the following components of acute stroke care: EMS pre-hospital stroke identification protocol, rt-PA protocol and 24/7 CT capability.

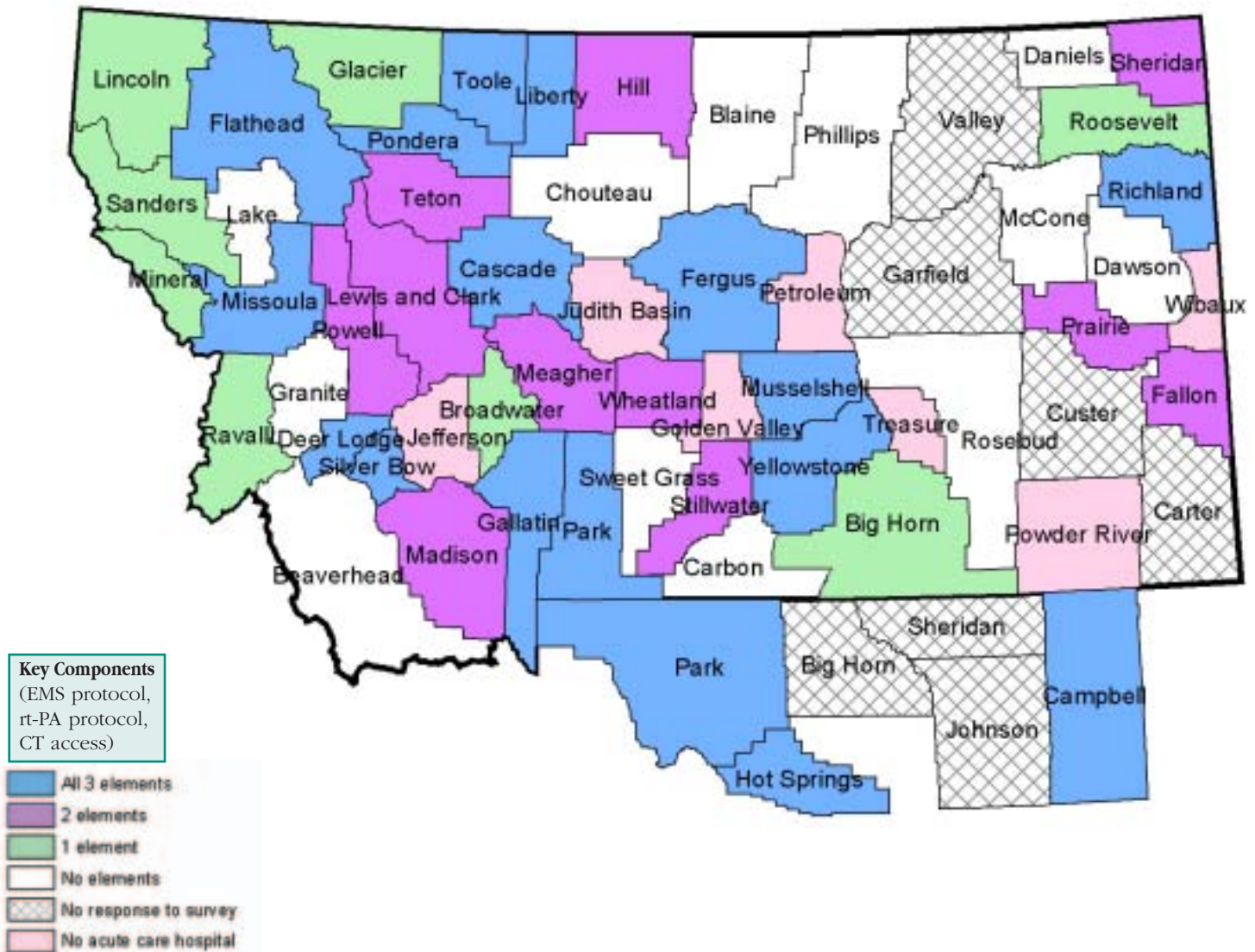
TABLE 1. Number of programs and services, diagnostic technology, personnel, and combined resources, overall, and by hospital size, Montana and northern Wyoming, 2004.

	Total Median (Range)	Large hospitals* Median (Range)	Small hospitals Median (Range)	P
Programs and services	4 (1-11)	6 (4-11)	4 (1-7)	<0.001
Diagnostic technology	3 (0-11)	10 (7-11)	1 (0-11)	<0.001
Personnel	0 (0-3)	3 (0-3)	0 (0-2)	<0.001
All	8 (1-25)	18 (13-25)	6 (1-17)	<0.001

\*Larger hospitals were defined as those with more than 50 inpatient beds, and smaller hospitals were defined as those with 50 or fewer inpatient beds.

# RESULTS

FIGURE 3. Availability of key components (EMS protocol; rt-PA protocol; 24/7 CT access) for diagnosis and treatment of stroke in Montana and northern Wyoming, 2004, by county





# SUMMARY

Despite the limitations of the self-reported data, it is apparent that both large and small hospitals in this large region have begun efforts to organize systems to identify and treat acute ischemic stroke. Gaps and challenges remain. In several communities in the region, small outlying hospitals now link their stroke services with a referral hospital. In addition, the state public health department in Montana has begun to support local efforts to improve community stroke awareness. It is our hope that this report will facilitate coordinated planning and development of acute stroke care across the region.



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# APPENDIX

TABLE. Availability of programs and services, diagnostic technology, personnel, and combined resources, overall, and by hospital size, Montana and northern Wyoming, 2004.

	Total (N = 58)†	Large hospitals* (N = 10)†	Small hospitals* (N = 48)†	Proportion of population‡
	% (n/N)	% (n/N)	% (n/N)	%
Outpatient/community services				
Community stroke awareness program	20 (11/56)	60 (6/10) <sup>§</sup>	11 (5/46)	49
EMS pre-hospital stroke identification program	51 (27/53)	67 (6/9)	48 (21/44)	62
Inpatient rehabilitation unit	49 (27/55)	56 (5/9)	48 (22/46)	60
Dedicated anticoagulation clinic	11 (5/44)	43 (3/7) <sup>§</sup>	5 (2/37)	32
Patient care units/areas and protocols				
Emergency department (ED)	100 (58/58)	100 (10/10)	100 (48/48)	100
Intensive care unit	60 (35/58)	100 (10/10) <sup>§</sup>	52 (25/48)	87
Stroke unit	7 (4/56)	20 (2/10)	4 (2/46)	33
Written ED stroke protocol	54 (30/56)	100 (9/9) <sup>§</sup>	45 (21/47)	77
Written rt-PA protocol	67 (39/58)	90 (9/10)	63 (30/48)	83
Acute stroke care map or pathway	26 (14/54)	56 (5/9) <sup>§</sup>	20 (9/45)	47
Acute stroke team	5 (3/58)	30 (3/10) <sup>§</sup>	0 (0/48)	23
Stroke diagnostic technology				
Cranial CT**	47 (27/58)	80 (8/10) <sup>§</sup>	40 (19/48)	81
CTA	30 (16/54)	100 (9/9) <sup>§</sup>	16 (7/45)	68
MRI	47 (27/58)	100 (10/10) <sup>§</sup>	35 (17/48)	81
MRA	38 (22/58)	80 (8/10) <sup>§</sup>	29 (14/48)	75
DWI	26 (14/55)	67 (6/9) <sup>§</sup>	17 (8/46)	57
Perfusion MRI	24 (13/55)	67 (6/9) <sup>§</sup>	15 (7/46)	54
Carotid duplex ultrasound	55 (32/58)	100 (10/10) <sup>§</sup>	46 (22/48)	86
TCD	23 (12/53)	88 (7/8) <sup>§</sup>	11 (5/45)	50
Conventional cerebral angiography	21 (12/56)	90 (9/10) <sup>§</sup>	7 (3/46)	60
TTE	31 (21/57)	90 (9/10) <sup>§</sup>	26 (12/47)	70
TEE	23 (13/56)	100 (10/10) <sup>§</sup>	7 (3/46)	64
Personnel for stroke care				
Neurologist**	18 (10/57)	80 (8/10) <sup>§</sup>	4 (2/47)	54
Neurosurgeon	14 (8/56)	70 (7/10) <sup>§</sup>	2 (1/46)	46
Interventional capabilities	22 (12/55)	60 (6/10) <sup>§</sup>	13 (6/45)	56

\*Larger hospitals were defined as those with more than 50 inpatient beds, and smaller hospitals were defined as those with 50 or fewer inpatient beds. †Because not all of the hospitals responded to each of the questions, the denominator for determining percentage in this column varies from question to question.

‡Proportion of the state's residents residing in a county whose hospital(s) provide each of the indicated diagnostic technologies, programs, and personnel in 2004.

§P-value ≤ 0.05. \*\*Cranial CT available 24-h per day, seven days per week and neurologist available in person or by telephone 24-h per day, seven days per week.

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